- Was sufficient reagent used? Repeat the test using an additional scoop of reagent.
- Was the reagent ineffective? Ensure that the reagent is fresh.

**Note:** *The colour of fresh reagent is dark grey; ineffective reagent that has been exposed to moisture in the air or other sources will have turned light grey in colour.*

- Was sample preparation or sample-reagent mixing adequate? Consider grinding the sample prior to weighing (maximum recommended particle size: 10mm).
- Was the temperature too low? Low readings may be recorded if the Speedy is used in very low temperatures. Take numerous readings in quick succession to raise the operating temperature of the Speedy.
- Was there a pressure loss? Visually check the cap washer for signs of holes or leak paths. Remove the pressure gauge and visually check the pressure gauge washer. Visually check the Speedy vessel and cap for hairline cracks.
- Is the pressure gauge defective? If the needle does not sweep smoothly across the scale plate, replace the gauge or return the Speedy tester to York Survey Supply Centre for service.

***Suspected High Reading***

If the Speedy gauge readings are higher than you expect or anticipate, check the following:

- Was the correct sample weight used? Ensure that the sample weight is weighed correctly.
- Was the gauge read correctly? Ensure that the Speedy is held in the horizontal plane at eye level when reading the pressure gauge.
- Was the temperature too high? High readings may be recorded if the Speedy is used in very high temperatures. If the Speedy is warm/hot to the touch as a result of taking too many readings in quick succession, allow time for it to cool down before taking more tests.
- Is the gauge defective? If the needle does not return to zero after releasing the pressure from the Speedy, replace the gauge or return the Speedy tester to York Survey Supply Centre for service.

**Recommended Spares and Consumables**

It may be wise to consider having the following spares and consumables available when using the Speedy tester, especially in remote locations:

- batteries for the electronic scale (1.5V AA - 3 required)
- Speedy cap washer
- pressure gauge washer
- pressure gauge (note the measurement range)
- cleaning brushes

Other spare parts for the Speedy vessel are available on request.

**Sample Preparation Table**

Refer to the table below for instructions on preparing your sample for analysis.

| ***Material Type*** | ***Recommended Preparation*** |
|---|---|
| Aggregate | Check maximum sample size. Crush if larger than maximum recommended particle size (10mm) |
| Dust | None required |
| Liquids | Mix with dry sand (see *Measuring Moisture Content in Liquids* earlier in this document) |
| Powders | None required |
| Sand | None required |
| Soils | Grind with mortar and pestle prior to testing (maximum recommended particle size: 10mm) |

The information in this manual is given in good faith. As the method of use of the instrument (and its accessories) and the interpretation of its readings are beyond the control of the manufacturers and suppliers, they cannot accept responsibility for any loss, consequential or otherwise, resulting from its use.

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YORK Survey Supply

# Standard Speedy Moisture Meter

**Code: 352100**

# Operating Instructions

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# Speedy Moisture Meter

## User Instructions

PROTIMETER

**Introduction**
The Speedy Moisture Meter is a portable system for measuring the moisture content of a wide range of materials including soils, aggregates, dust and powders (and liquids). The system consists of a rugged plastic case containing a low-pressure vessel fitted with a pressure gauge and an electronic scale and ancillaries.

Moisture measurements are made by mixing a weighed sample of the material with *calcium carbide* reagent in the sealed pressure vessel. The reagent reacts chemically with water in the sample, producing acetylene gas that in turn increases the pressure within the vessel. As the pressure increase in the vessel is proportionate to the amount of water in the sample, the moisture content can be read directly from the calibrated pressure gauge.

**Safety Precautions**
- The calcium carbide reagent used with the Speedy Moisture Meter is a hazardous product that must be handled with care by the user and with consideration for the environment. Users must follow calcium carbide transportation, storage handling and disposal guidelines in accordance with local regulations and/or the calcium carbide Material Safety Data Sheet (MSDS). Users should be familiar with the hazard identification, first aid measures, fire-fighting measures, accidental release measures, personal protection measures, physical and chemical properties, stability and reactivity, toxicological information and ecological information as given in the MSDS.

- Users of the Speedy must be familiar with the Speedy Moisture Test Procedure detailed in this manual.

**Moisture Test Procedure for Standard Size Speedy**

A standard size Speedy is shown in the photograph to the left. The moisture test procedure is simple to follow and takes just a few minutes for most materials. However, to ensure accurate and consistent results the procedure should be followed precisely. To test your sample, refer to the photographs below and complete the following steps:

1. **Clean the Speedy vessel:** Prior to using the Speedy tester, ensure that the inside of the Speedy cap and vessel are empty and clean. Use the bristle brush to remove any residues from previous tests.
2. **Select and prepare the sample:** Ensure that the sample to be weighed and placed in the Speedy is representative of the material that is under investigation. Some materials, such as free-flowing powders and sands, need no preparation whereas others may need to be ground prior to testing. See the Sample Preparation Table at the end of this document for further information.
3. **Weigh the sample:** Place the empty measuring beaker on the electronic scale and zero the scale (refer to the electronic scale user instructions for further details). Add small amounts of material from the sample until the correct sample weight, 6g, is reached.
4. **Add the sample to the Speedy vessel:** Pour the sample into the chamber of the Speedy vessel.
5. **Add the reagent to the Speedy cap:** Using the metal scoop, add a minimum of two full scoops of calcium carbide reagent to the Speedy cap cavity.
6. **Seal the Speedy:** Hold the Speedy horizontally and position the cap as shown. Then swing the stirrup into position and tighten the top screw to seal.
7. **Mix the sample with the reagent:** Hold the Speedy vertically with the pressure gauge facing the ground and shake vigorously for five seconds. Rotate the Speedy through 180° so that the pressure gauge faces the sky, tap the sides of the Speedy to ensure the sample falls into the cap cavity and prop or hold the Speedy in this position for 1-2 minutes.
8. **Take the reading:** Hold the Speedy horizontally and at eye level and take the moisture content reading directly from the pressure gauge.
9. **Release the pressure:** Hold the Speedy vertically with the pressure gauge facing the ground. Locate the arrow on the flange of the cap and point this away from yourself and other people in your vicinity. Unscrew the top screw slowly to vent the gas that may have been generated within the Speedy.
10. **Remove the sample and reagent:** Tip the contents of the Speedy directly into a clean and dry open container and dispose of in accordance with *Section 13 of the Calcium Carbide Material Safety Data Sheet*.
11. **Clean the Speedy:** Clean the Speedy vessel, cap and measuring beaker in preparation for the next moisture measurement.

**Special Considerations**
Use the instructions in this section to adapt your test procedures to special measuring conditions.

***Applying the Proportional Test Technique***
If the moisture content of the material exceeds the measurement range of the Speedy being used, then the *Proportional Test Technique* may be used to obtain measurements. This involves halving the normal sample weight and doubling the gauge value. For example:

1. Assume a Speedy with a measurement range of 0-20 $H_2O$% W/W is being used to test soil with a nominal moisture content of 30%
2. The sample is prepared as required and half the normal weight (i.e. 3g) is placed in the Speedy.
3. The normal test procedure is followed and a gauge value of 14.7% is recorded.
4. This value is then doubled to give the actual moisture content of 29.4%.

The *Proportional Test Technique* may also be used to obtain clearer readings in very dry material by doubling the sample size and halving the gauge value.

***Compensating for Non-Standard Temperature***
For optimum performance the Speedy tester and sample should be at 20°C (68°F) when used. If this is not practical, take at least three tests in quick succession to equilibrate temperatures as much as possible. Ignore the first and second test results and record the later results.

***Establishing Correction Factors***
When compared with oven test results, Speedy readings may be low if the material under investigation contains volatile components other than water, as these may evaporate with the water at elevated temperatures. Correction factors for given materials can be established by plotting graphs of Speedy test results against oven test results.

***Measuring Moisture Content in Liquids***
Speedy testers may be used to measure the moisture content of certain liquids (most commonly oils) by adapting the test procedure as follows:

1. Weigh the liquid sample as in the standard procedure.
2. Place the liquid in a clean mixing vessel and add two to four scoops of dry sand. Mix the contents thoroughly and place the mixture in the Speedy vessel.
3. Continue with the test as detailed in the standard *Moisture Test Procedure*.

***Converting Wet Weight to Dry Weight***
The pressure gauges used with the Speedy testers are calibrated to give the moisture content expressed as a percentage of the sample's wet weight. If required, the measured value (MWW) can be expressed as a percentage of the sample's dry weight (MDW) by using the following formula:

$$MDW = \frac{100 \times MWW}{100 - MWW}$$

**Troubleshooting**
Use the following procedures to troubleshoot suspected inaccurate results.

***Suspected Low Reading***
If the Speedy gauge readings are lower than you expect or anticipate, check the following:
- Was the test procedure followed correctly? Ensure the correct sample weight is used, the sample is placed in the Speedy vessel and the calcium carbide reagent is placed in the Speedy cap. Also, make sure the Speedy vessel and cap are united and sealed in the horizontal plane to prevent premature contact of the reagent and sample.
- Was there adequate cleaning of the Speedy vessel and cap between tests? Ensure all residues from previous tests have been removed from the cap and vessel before starting a new test.


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